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ABSTRACT

The development of the Regional Marine Science Project in Carteret County, North Carolina, is portrayed in this booklet. Established with Elementary and Secondary Education Act (ESEA) Title III funds in 1966, the project has evolved from one high school course in marine ecology to numerous courses and activities at all levels, primary through college. Oriented to field ecology as an approach to understanding coastal environments, the project makes extensive use of field trips, setting up discovery-type situations with complex problems for group investigation. Phases of the program are described in eight categories: curriculum development and instruction, research on field trip techniques, inservice training, summer science school, marine science library and audio-visual aids, publications, regional coordination of marine science education, and planning for an exhibit, laboratory and field trip center. An array of pictures depict many of the student activities. In addition, staff photos and biographies are included. This work was prepared under an ESEA Title III contract. (BL)

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THE REGIONAL MARINE SCIENCE PROJECT

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OF THE CARTERET COUNTY, N.C., PUBLIC SCHOOLS

by WILL HON, project director

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EXPERIMENTS IN THE USE OF **FIELD ECOLOGY** AS AN APPROACH TO UNDERSTANDING **COASTAL ENVIRONMENTS**

That a boy and a dolphin became inseparable friends in Naples, Italy, about the time of Christ is a legend of questionable origin. Modern experiences with dolphins show that the story could very well have been true.

Today, anyone visiting our coast is likely to see the boy on a dolphin as a symbol of a lusty new friendship between children and creatures of the sea. In Carteret County, boy and dolphin laugh at you from the side of a bus that shuttles school classes to marshes and beaches; from the boat that ferries them to the tidal flats; from the buckets that classes excitedly fill with squirming sea animals for laboratory study; from the rostrum of regional in-service programs; and from a broad array of publication covers. The spirit of the boy-dolphin rapport is no legend in Carteret County now, but a reality made possible by ESEA Title III funds and a county full of interested people.

AN ESEA TITLE III PROJECT

4

THE SETTING AND

The birth of a public school marine science project in Carteret County is no fluke. It is the logical outgrowth of something that everybody knew and felt strongly for years: "We are sea folk and need to know what that means to our past, present, and future." There could scarcely be a happier setting for such an experiment.

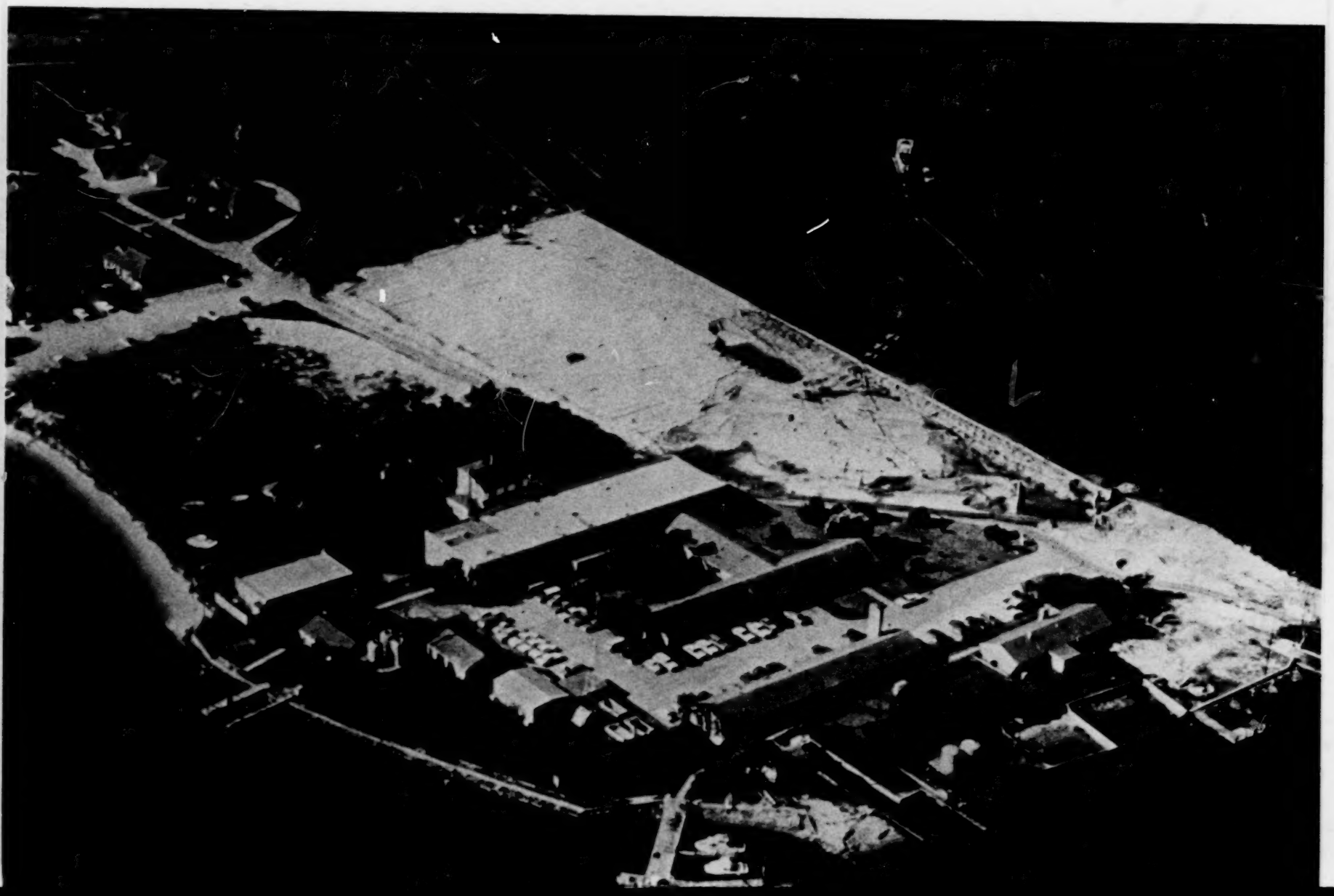
Carteret County has the state's largest commercial fishing fleet and a large sport fishing fleet; one of the two deepwater seaports; six marine research laboratories; a major Coast Guard station; Cape Lookout National Seashore; a state park and a wildlife refuge; miles of beach resorts; the office of the state's fisheries division; processing plants for seafood, fish meal and oil; a history of sea adventure, including Edward Teach alias Blackbeard; and a people thoroughly attuned to the sea for their livelihoods and recreation.

Cram all of this into a county of only 30,000 residents and you have a truly sea-oriented society.

Beaufort is a name very familiar to marine biologists. For over half a century it has been headquarters for many distinguished series of scientists, including ecologist A. S. Pearse and biologist-writer Rachel Carson. Today dozens of marine scientists work there in three sophisticated laboratory complexes.

Two federal laboratories have been historically important in research on commercial species and now occupy well-equipped modern facilities. Both are part of the research system of the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service. The Biological Laboratory specializes in the dynamics of commercially important fish and shellfish populations. The newer Radiobiological Laboratory traces, with the most modern research tools, the complex flow of energy through estuarine ecosystems.

Dr. Pearse initiated the Duke Marine Laboratory, which has since grown to fame in the areas of invertebrate physiology and oceanography. It



THE IDEA

operates the "Eastward" (NSF research vessel) and several smaller boats, and teaches summer courses.

Three other laboratories are in nearby Morehead City. The Institute of Marine Sciences (formerly the Institute of Fisheries Research) is operated by the University of North Carolina. It now occupies a fine new laboratory building and continues its teaching and its research on a wide variety of marine species and the economic potential of estuaries. The state Division of Commercial and Sports Fisheries recently added a research facet, including the exploratory vessel "Dan K. Moore" and lab facilities. Marine Chemurgics is a newer private laboratory interested in improved techniques of seafood processing. It has received grants for its exploratory research.

Carteret County is in the middle of the North Carolina coast, and includes that spearhead of land known as Cape Lookout. It is just south of Cape Hatteras, which is an unusually clear breaking point in the north-south distribution of plants and animals. Beaufort and Morehead City are protected by the necklace of barrier beaches which stand between them and the ocean. The shallow sounds behind these "banks," as they are called, have always yielded richly to fisherman and now display their richness to classes of eager young explorers who are part of the Marine Science Project.

Largely because of their affection for the sea, coastal people are reluctant to think of the drastic changes time and progress will bring. They do not know how to weigh what they now do against other uses of marine resources.

The Marine Science Project is therefore an examination of a region's attitude toward a sea that embraces it physically, culturally and economically. In these counties where the spoken words all have a briny flavor and the family trees are rooted in the sea like mangroves, the new generation must rethink its value judgments.

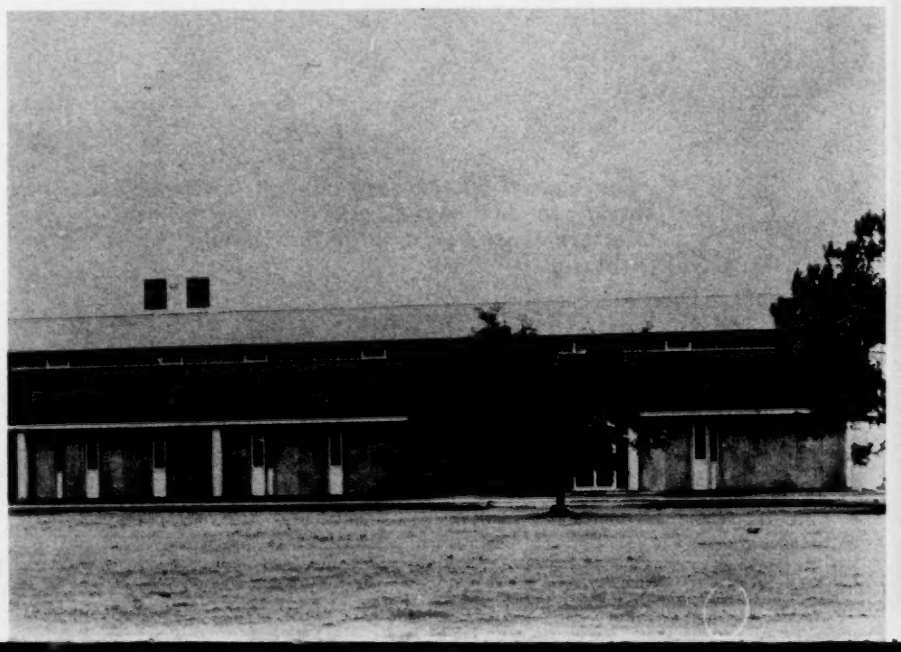
The approach has been through the public schools. The target has been grades four through twelve, building from gentle coaxing at the lower level to a tough, elective, college prep program for upperclassmen in the high schools.

The message has been ecology. The chief tool has been the field trip. The classroom has not been deserted, but every classroom presentation implies a coming field experience, and each page of written material is treated as a temporary stand-in for reality. To a degree unique in this area, the students go out into the field and do what students are usually accustomed only to talking about.

Neither the educational principles nor the scientific materials are earth-shaking. However, the need for some group to translate technical jargon about the nature and significance of coastal ecology into readable popular materials has long been known. Compared with the rocky coast to the north or tropical seas to the south, the mundane mid-Atlantic coast has been ignored.

It is true that the publishing companies have rediscovered the sea, but they print books of predigested facts about the seashores of broad geographical areas or about the great new adventures in ocean engineering.

There is no book which makes a foot-soaking in a *particular* marsh more meaningful. This is to say that there are now many reference books for background lectures on oceanology, but nothing to give school teachers and students a field approach to coastal ecology in this region, the middle of the Atlantic seaboard of America. There is a great demand for such materials.

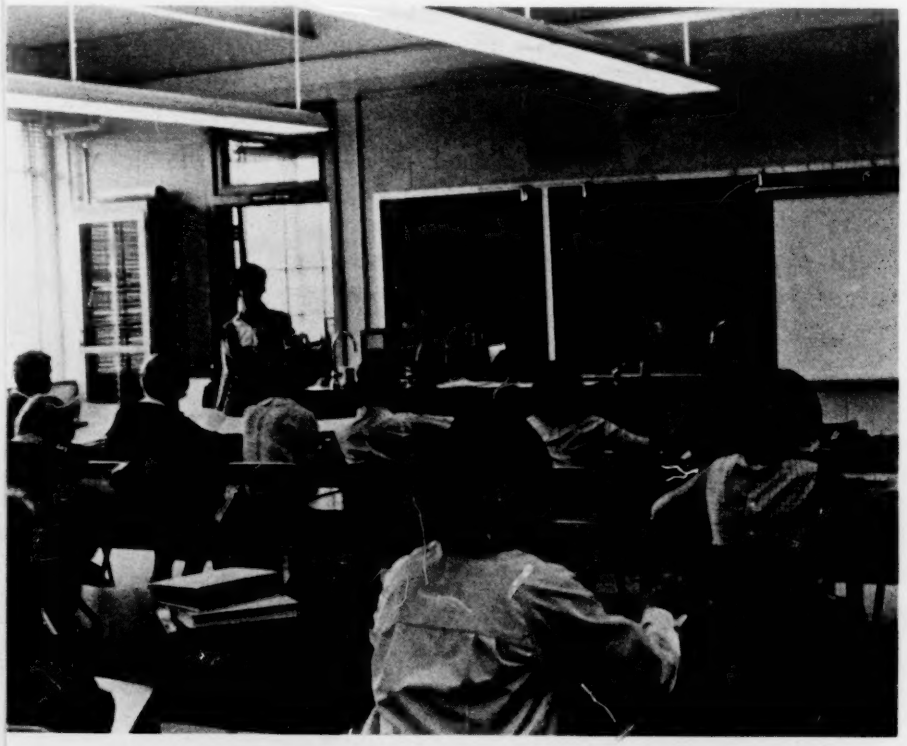


LEFT: *Pivers Island, Beaufort, showing the two Bureau of Commercial Fisheries Labs in the foreground, with holding tanks, shops, and docks. Duke Marine Lab is to the rear, but the docks and oceanographic portion are not shown.*

RIGHT: *Institute of Marine Sciences at Morehead City. Experimental ponds and tanks are to the rear by Bogue Sound.*

THE GRANT

Carteret County Public Schools received a planning grant in 1966 from Title III of the Elementary and Secondary Education Act of 1965. A director was hired and from the germ of an idea created by the county superintendent talking to local marine biologists, a large plan grew. There was to be a major facility to serve as a nucleus for instruction, exhibits, laboratory work, library reference, research and dissemination of literature. However, the planned building has not materialized. The Vietnam War halted construction under Title III and caused the Marine Science Project to search for ways to teach without the facility and its equipment.



THE OLD CLASSROOM . . . .

Four-walled classrooms cannot be eliminated, but marsh to the right, and the sound-side amphitheaters on the next page give a vitality to science teaching.

. . . AND THE NEW ONES

THE PROGRAM

Without a building, the Marine Science Project neverless has managed to be a center for:

1. CURRICULUM DEVELOPMENT AND STRUCTION
2. RESEARCH ON FIELD TRIP TECHNIQUES
3. IN-SERVICE TRAINING
4. SUMMER SCIENCE SCHOOL
5. MARINE SCIENCE LIBRARY AND AUDIO-VISUAL AIDS
6. PUBLICATIONS
7. REGIONAL COORDINATION OF MARINE SCIENCE EDUCATION
8. PLANNING FOR AN EXHIBIT, LABORATORY AND FIELD TRIP CENTER

Each of these phases is depicted in the pages that follow, based on two years of the operational grant.

The project occupied temporary quarters through its first year, then renovated two classrooms for office space. That phase was short, ending with total destruction when the school burned in September of 1968. All equipment, library books, files, and manuscripts were destroyed. The project is currently housed in the Radiobiological Lab of the U.S. Bureau of Commercial Fisheries . . . an example of the fabulous cooperation given to the project by the four local marine research laboratories.

CURRICULUM DEVELOPMENT AND INSTRUCTION

THE NEED: Only in recent years has marine science been considered a suitable subject for secondary schools. Perhaps the reason is that nobody asked coastal people. The interest has been there, and now educators are recognizing it. However, development has entered in New England, Florida, and California. Even though course guides are now beginning to appear, they deal with other geographical areas, other biota and different resource problems.

THE APPROACH: The Marine Science Project added two new courses to Carteret County's high schools in 1967-1968, then refined and continued them in 1968-1969.

In both high schools, Judith Scarff of the project staff selected college prep students and presented a full year course: MARINE ECOLOGY. The emphasis has been on the philosophy and methodology of science, using local marine situations to demonstrate basic principles of ecology. Unusual aspects of the course have been the number of field trips (about fifteen), weekend work with students showing special interest, and research projects for all students under the guidance of working biologists. In 1968-1969 this course was taught only in the high school in the relatively urban western part of the county, where many college preparatory students desired advanced biology. Fifty students are now enrolled in two classes.

Acceptance of the challenging new material has been so enthusiastic that an even more advanced research-oriented seminar course will be offered in the 1969-1970 school year. About ten top students are expected to participate.

The rural eastern part of the county had special needs. Fishing is the historical basis of the economy, and most families are still of, by and for the sea. Most students do not plan to attend college, but to live and work in this county. For them a special course was designed: COASTAL AFFAIRS, taught by project director Will Hon.

Emphasis in this course is on applying ecological knowledge to problems of managing coastal resources. It examines man's role at the edge of the sea by teaching ecology through field trips and research, then considers the future through projection of trends and by debate. It strives to round out the value judgments of students by giving them experience with all agencies, programs and philosophies involved in determining the future of our seacoasts.

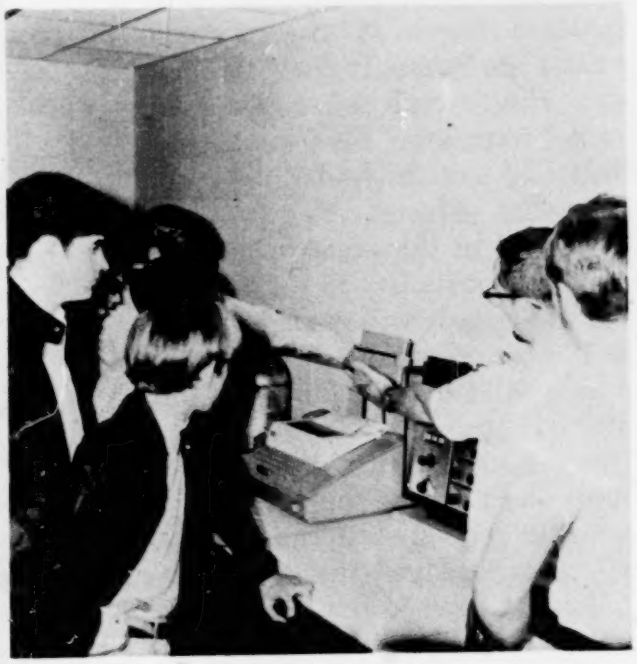
THE FIELD

Even in winter, when the tide and weather are right, the ecology of a mudflat holds many fascinating problems for a well-prepared class.

EMPHASIS OF THE HIGH SCHOOL COURSES

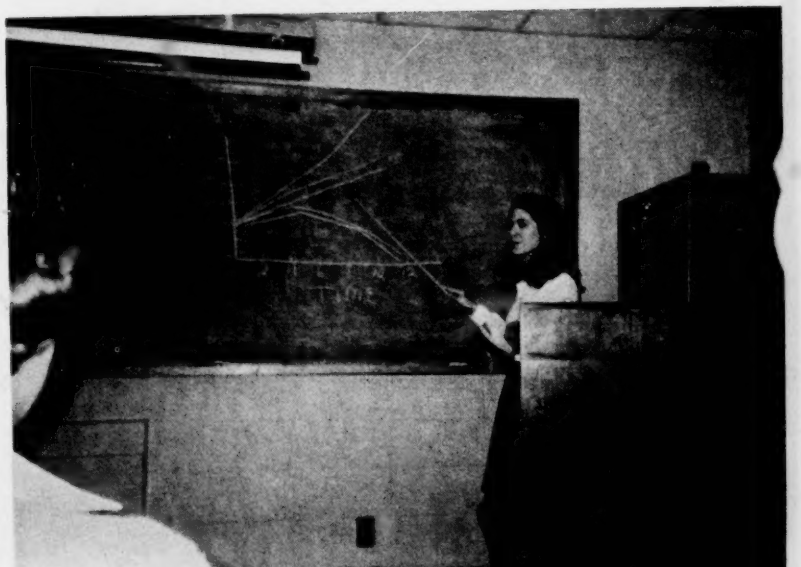
RIGHT: *Looking at live plankton in a laboratory by the sea opens up a new world to most students.*

BELOW: *When the high school students have begun to understand the process of exploring marine environments, they visit local laboratories to see professional research.*



RIGHT & BELOW: *The next step is to involve advanced students in long-term individual research projects.*

CORNER: *The results of these projects are reported in a spring seminar attended by marine biologists and the public.*



Three-week teaching units are being prepared for grades four through ten to supplement existing science instruction. Each unit replaces one or more chapters in the current textbook and includes: student text and classroom exercises, additional notes for teachers, guide to films and reference materials, tests and answer sheets. Each unit is climaxed with a suitable field trip, for which basic information is given, and teachers are provided a special guide on how to conducted the field portion.

For tenth grade biology classes, two units and field trips are being prepared by staff member Beth Taylor. The first, already complete, is a comprehensive introduction to ecology as an approach to nature. It is a survey of coastal communities which, through photographs, diagrams, and words analyzes the forces that shape natural communities by the sea. The classroom material includes class notes and laboratory exercises, additional notes for teachers, tests, movie and book references and a slide series to illustrate communities. The field trip is a summary of the principles presented, using the salt marsh as the basic demonstration.

The spring unit, now in preparation, is designed to close the school year by pulling together and correlating the biological facts learned during the course. The field trip will be several upland habitats: savannah, pocosin, longleaf pine subclimax, climax hardwood forest and successional stages of its development.

In the early fall of 1968, every biology class in Carteret County was taught the unit. The Marine Science staff collaborated with regular tenth grade teachers on class presentations and conducted the field portion.

The eighth grade unit called THE SEA AND ITS BOUNDARIES, has been used in a dozen classes, revised and enlarged, and is available in mimeographed form. The commercially printed version is due this spring. It includes discussions of waves, beaches, dune stabilization, longshore current, and physical oceanography. Three films and a field trip to the beach are integrated into the unit.

The seventh grade unit, SALT MARSH, SOUND AND SEA BEACH, is a study in natural communities by the sea. It considers the variation of life from beach to dune to marsh to mudflat, and explores reasons for the spectrum of environments and life forms. It is available in preliminary form. Junior high units have been prepared by Frank Chapman of the project staff.

The sixth, fifth and fourth grades units are being prepared in that sequence. The first will deal with the potential of the ocean in serving man, and of man's responsibility in its management. The fourth grade unit will consider adaptation and how it fits individuals for survival. The fifth grade unit will tie individuals together with community concepts.

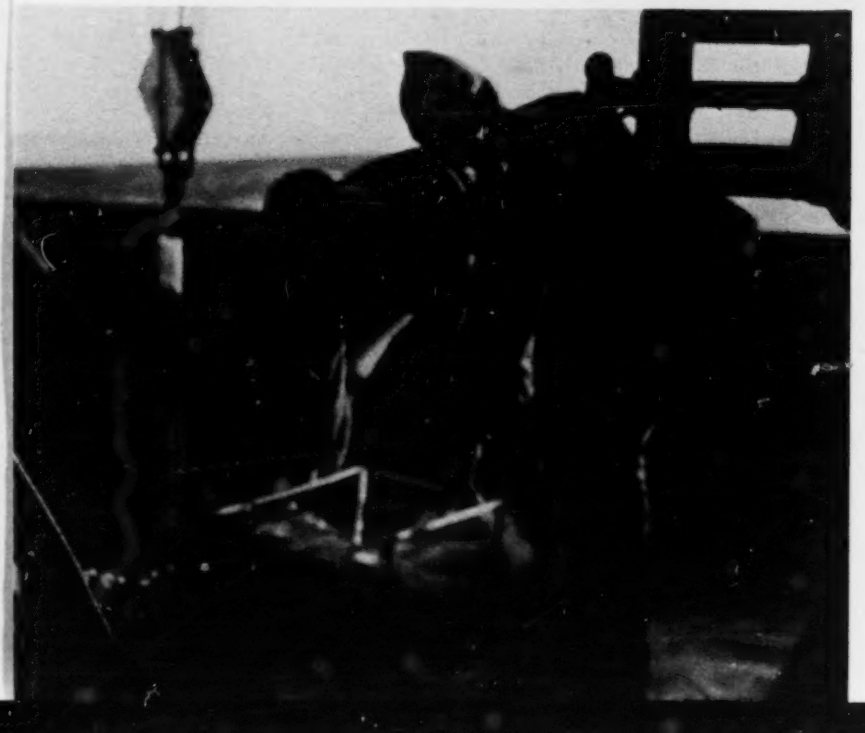
In April and May of 1969 all fifth grade classes studied a brief unit on life in the sound and were taken on a two-hour trip aboard the sailboat "Diamond City". They dredged the sound bottom for animal life and learned the language of ships and navigation.

On two Thursdays in May an exciting experiment will be tried. The students of the two MARINE ECOLOGY courses have designed a short unit for second graders. They will serve as trip leaders in May, three high school students conducting each second-grade class on a trip to a tidal mud flat.

To culminate the 1968-69 school year, a full week of special activities is being featured. Marine Science educators from the entire Atlantic seaboard will be invited to observe a wide variety of field trips, student seminar of original research papers, guest speakers and discussions of marine science education.

Two supplementary books are being prepared to stimulate and guide interests of primary students. A DAY WITH DON AT CAPE LOOKOUT SEASHORE was printed in 19[illegible] and A DAY WITH DON ON THE MUD FLAT will follow soon. Both books were written under special contract by Bitsy Dudley and Doris King.

At the opposite end of the spectrum, the Marine Science Project assisted six college ecology classes in field trip conduct and evaluation in 1967-1968. The demand continues for assistance to collegiate groups.



LEFT: *By maintaining contact with marine biologist, the Marine Science Project is able to arrange many special trips for advanced students.*

FIELD TRIP TECHNIQUES

NEED: The field trip, while widely accepted as an idea, is still seldom used in smaller school systems. Administrative support, transportation, time, expert field leadership, specific localized information about sites, and accident liability are all problems that stymy most teachers.

Field trips require approaches and techniques unfamiliar to the average classroom teacher. Marine habitats have inherent potentials unknown even to competent biology teachers.

APPROACH: The Marine Science Project set up a field trip section under the guidance of staff member Larry Yeater. The preliminary phase of his work was to survey potential field trip sites and select the necessary supplies and equipment for conducting trips for local and out-of-county teachers. In 1968 field assistant Dick Lewis was added to the staff.

Basic equipment includes a ¾-ton truck with storage compartments, serving as a mobile laboratory; a 36-seat bus for student transport; and a twin-engined pontoon boat for short movements of a dozen students at a time. Trawling, dredging and long-distance ferrying services have been by rental of local boats. The project acquired minimal quantities of SCUBA gear, nets, collecting apparatus, preservatures, field test kits and glassware.

As the eighth and tenth grade units were developed, a field trip was evolved to supplement each. The coastal processes trip has been tested on numerous eighth grade and high school classes as well as on teacher groups. The tenth grade trip was tested on the twenty classes of this county in 1968 and has since been used with several out-of-county groups.

The philosophy of field trips has been to set up discovery-type situations . . . complex problems for group investigation. A typical approach is to take a class, in field clothes, to a marine community, and settle them in an advantageous spot. The leader guides them in looking at the area in new ways and in asking pertinent questions about what makes it function as a natural community. When several good questions have been formulated, groups are assigned to explore them. After an hour or more of collecting, measuring, and arguing among themselves about what they are seeing as groups, the class reconvenes. Each group presents its problem and its discoveries, then defends its explanation of the situation observed. The other students may question the conclusions and are in turn questioned about their own research. The field trip leader has subtly guided the choice of questions, has provided the names of plants and animals (but *not* answers to the problem), has refereed the discussion, and then conducts a classroom review and evaluation of the trip.

Best results are obtained when teachers prepare the students by using our regular units. However, more than a dozen out-of-county groups have visited with no preparation and have been led on similar field trips. Science clubs and tenth grade biology classes respond well.

For the two high school elective courses in Marine Science, more sophisticated trips are developed. A dozen or more students may be taken on an overnight trip to the Outer Banks in order to spend a full day of guided research. Classes explore local technical libraries, research laboratories, the port terminal, marine industrial facilities and shipbuilding yards.

An overnight trip to Core or Schackleford Ban does not offer either luxury or relaxation. Studen work through the day and night to gather info mation and draw conclusions, under the guidan of the Marine Science staff. The eager anticipatio of the inside front cover is replaced by the satisfi exhaustion below.

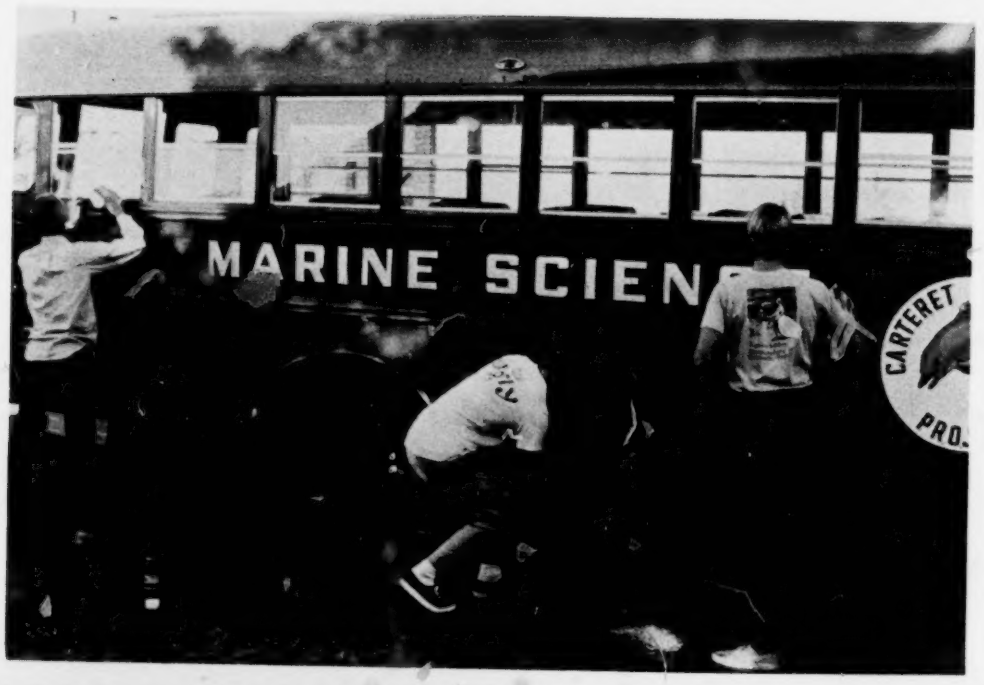
12

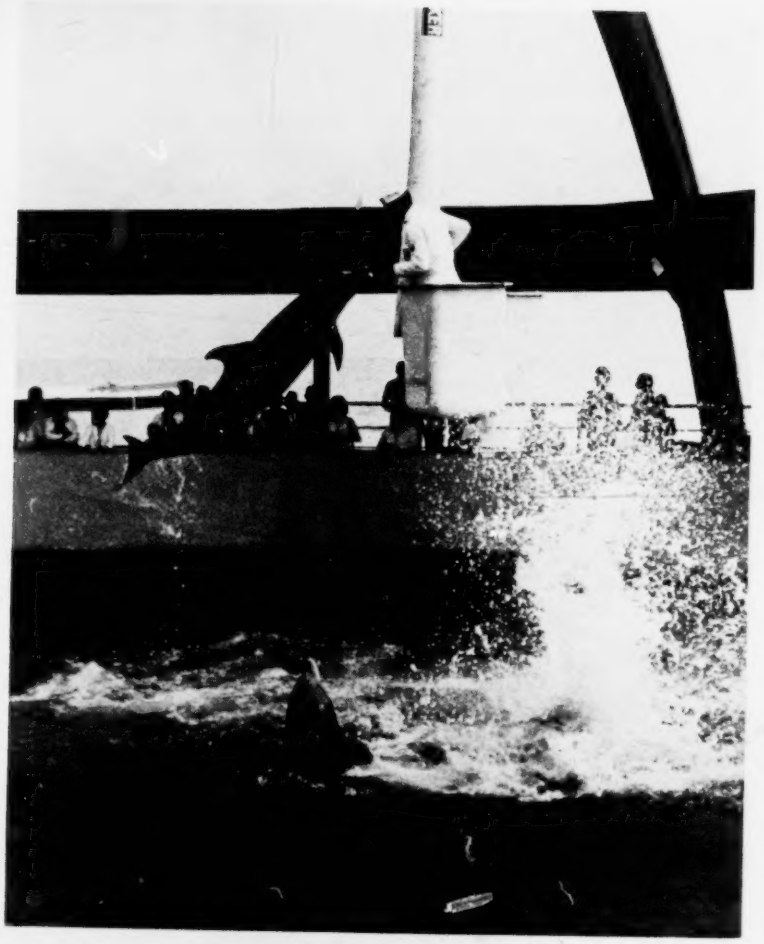
One of the most successful field exercises has been a local working trip to plant dune-stabilizing grasses, coupled with a ferry trip to Ocracoke Island to see massive federal projects of the same type.

The ultimate in field trips is the highly selective junket to Florida, open to the better students in the MARINE ECOLOGY course. In the spring of 1968 Yeater took four boys by car and this fall he and Lewis took eight boys by bus as far as the Florida Keys. In a carefully-selected series of stops the boys, who had already proven special interest in marine science, examined eight beaches, visited Marineland and Silver Springs and the associated research facilities and saw the Everglades and the Keys. With the continual guidance of an instructor, this was a uniquely broadening experience.

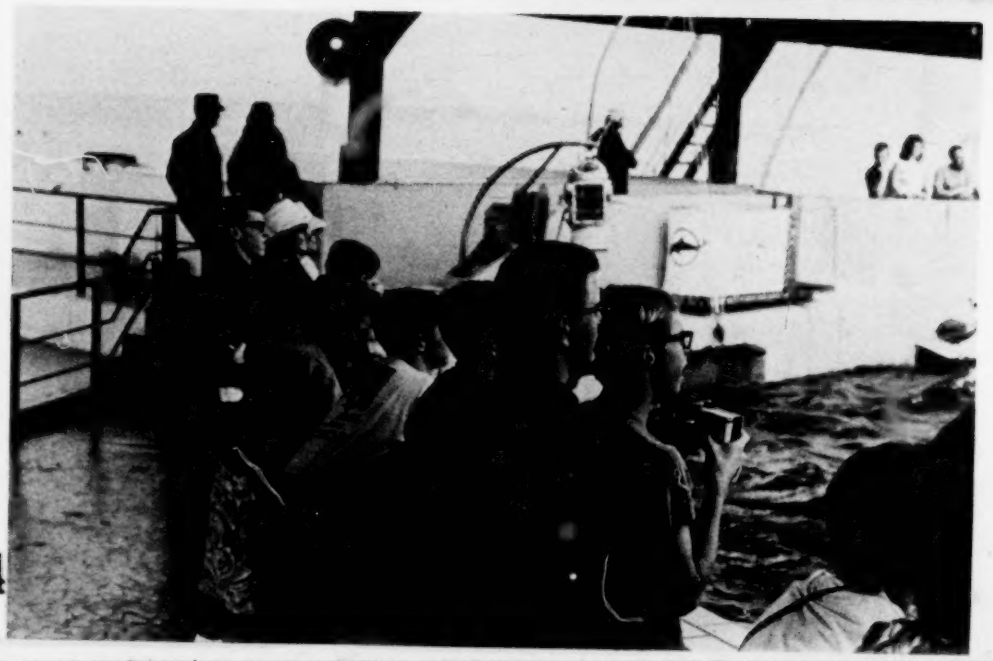
In the spring of 1969 the technique was tried successfully with tenth graders. Eight boys who are likely to be in the MARINE ECOLOGY course next year were taken on a six-day Easter vacation tour by project member Yeater and a tenth grade biology teacher.

The hardest projects undertaken by the students are the ones most appreciated. Planting grasses to build new dunes is a job with purpose and great educational value.





MARINELAND



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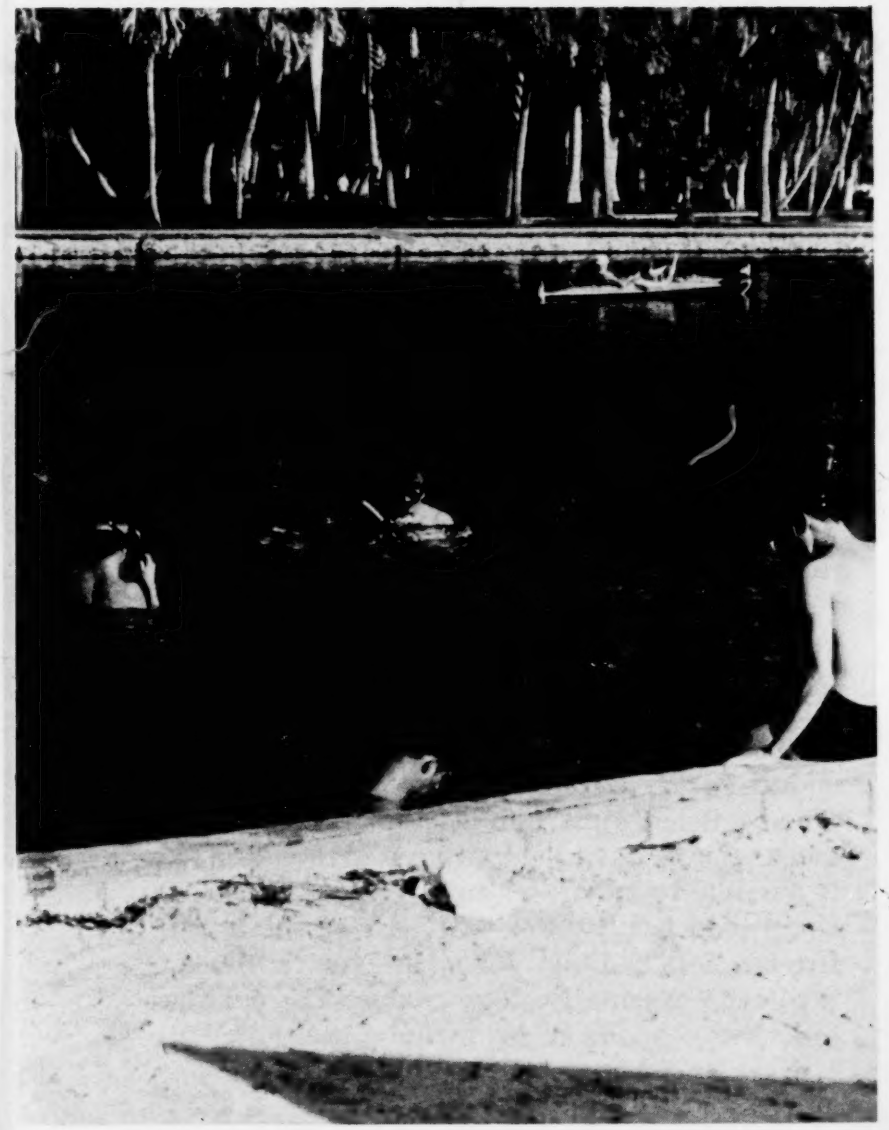
THE

FLORIDA TRIP



SILVER SPRINGS

IN-SERVICE TRAINING

NEED: Both emphases of this project are beyond the scope of most of our teachers: *marine science*, as a subject, and *field trips*, as teaching tools. No place exists in the eastern Carolinas for instruction in either area, and nowhere on the Atlantic Coast for our teachers to study them in combination.

APPROACH: The Marine Science Project began in-service training in the spring of 1968, taught entirely by the project staff.

For elementary teachers, four half days were set up on Saturdays in March, April and May. Eighty teachers attended for certificate credit and stipend. Two Saturdays were devoted to lectures, demonstrations, films and discussions. Two sessions were field trips to the beach and to an estuarine mud flat. The purpose was to give elementary teachers a general background in local ecology, and to begin their preparation for use of teaching units to be ready in the months ahead.

In April, all Carteret County secondary science teachers were brought together for three full days of basic instruction and introduction to the eighth grade unit. Three major field trips added reality to lectures, chalk talks and movies for these twenty. The only unit then ready, the junior high study of coastal processes, was featured, and all science teachers became familiar with its fundamental concepts. They received certificate credit and a stipend.

Further work with the same teachers has been conducted in the spring of 1969, but junior and senior high teachers met separately to consider specific units. ALL TEACHERS WERE WELCOME to both sessions, and announcements were sent to counties which seemed likely to be interested.

The March 26-29 program for junior high science teachers considered the seventh and eighth grade units. The participants will be given revewal credit and a stipend. The field trips for each unit were conducted in the same way as they are for the students. Subject matter and visual aids were studied so that teachers may present the unit, but the Marine Science Project will conduct all field trips for local classes. The staff will also host out-of-county groups or assists teachers in adapting the trips to their locale.

In April, tenth grade biology teachers had an opportunity to study the fall unit, already used in this county, and the new spring unit. April 24-25-26 was a Thursday night-Friday-Saturday combination for which there is a stipend but, of course, no renewal credit because of the shortness of the workshop.

In the summer of 1969 there will be six weeks of intensive training in marine life, ecology and geology for twenty teachers. Scholarships will be available for out-of-county as well as Carteret teachers.

SUMMER SCIENCE SCHOOL

NEED: As demonstrated over the past dozen years, there is great demand for a summer program of guided, useful fun for children. What began as a project for the children of local marine biologists had grown into an annual self-supporting Summer Science School. However, by 1968 volunteer help had worn thin; leadership was not available and the existence of the school threatened.

APPROACH: In 1968 the Marine Science Project adopted the Summer Science School, confined its subject matter to marine science and enlarged its scope. Three two-week sessions were operated from June 17 to July 26. The enrollment was more than doubled, with over a hundred students attending the first two sessions. Many scholarships were offered in an effort to serve disadvantaged students. The Marine Science director served as coordinator and the staff gave field trip assistance to make it possible to handle so many children with the small paid faculty. For each session there were five teachers and high school assistants who had taken the Marine Ecology course. The curriculum was expanded to include the following courses and some classes were taught in both Morehead City and Beaufort.

"Introduction to Seashore Life"
(three grade level sections)
"Life of the Beach"
"Life of the Sound"
"Life of the Marsh"
"Guided Research" (secondary level)
"Seashell Animals"

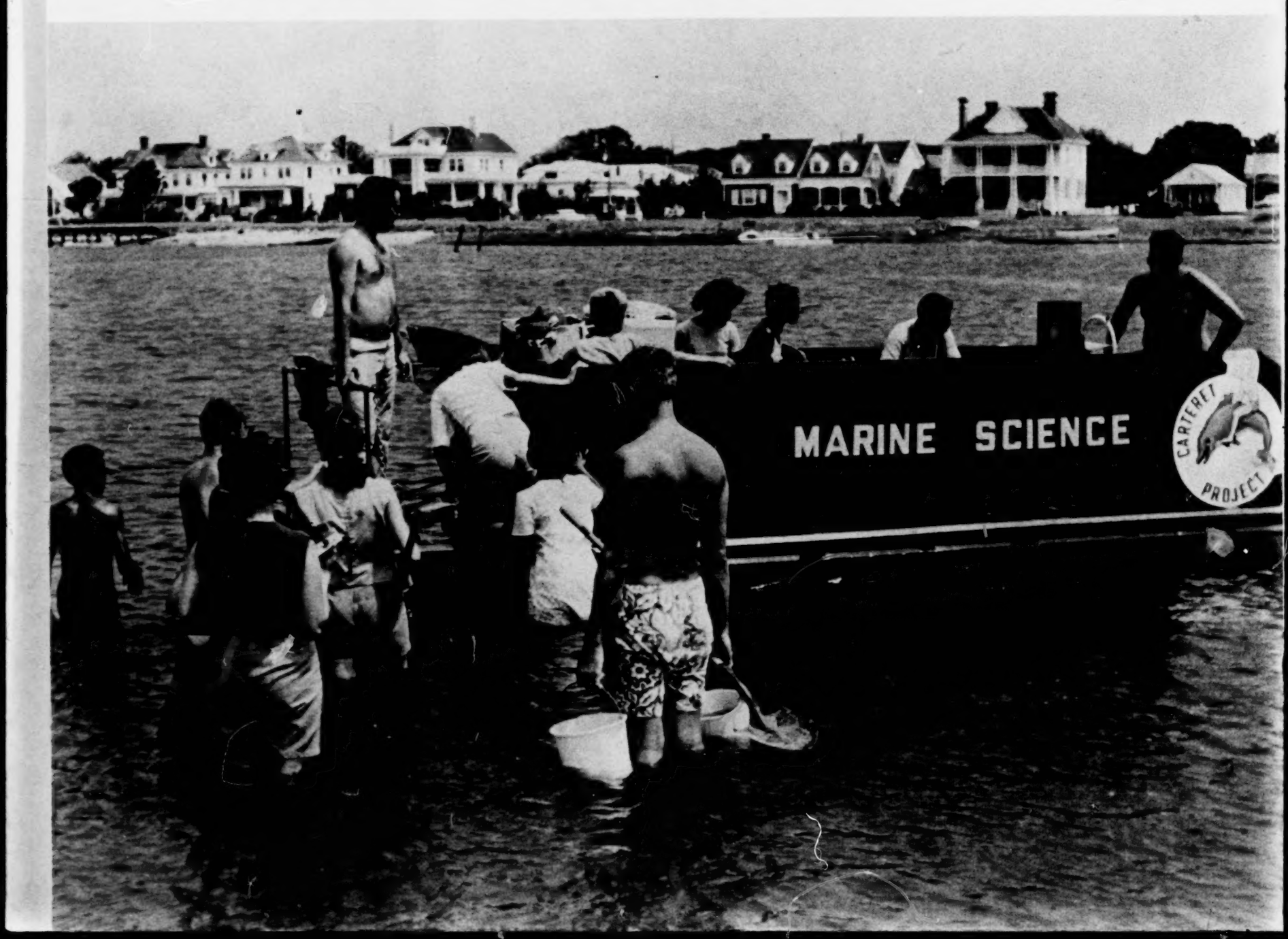
Classes met on Monday, Wednesday and Friday from 9-12 noon. The school system turned Queen Street High School and two rooms at Morehead Elementary School over to the project, and provided a bus and driver at each school.

Classes began at the school building and there were short lectures, demonstrations and movies. But every day was field trip day. In a purposeful way, classes combed the beaches, marshes, jetties, mud flats and even the decks of shrimp trawlers for interesting seashore life.

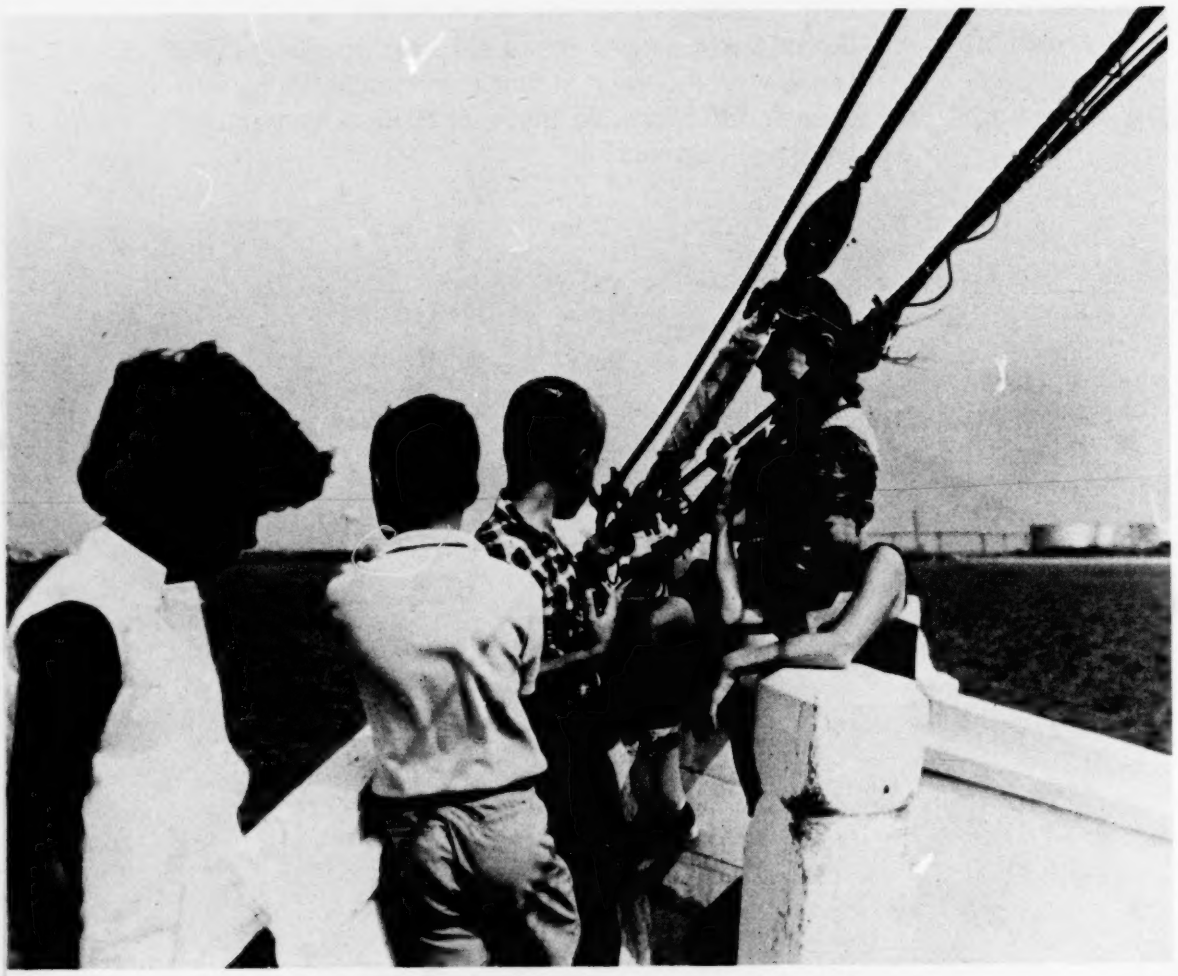
Upper level students engaged in guided individual research projects. Skin diving was scheduled but cancelled for lack of a good pool for preliminary instruction. It will be attempted again in the summer of 1969.

The success of the school was largely due to the fact that ten different instructors . . . housewives, graduate students, and school teachers . . . were available who just happened to have knowledge and experience in marine science. This is due to the nature of the area, which is a nucleus for marine research and university coursework.

Not as part of the Summer Science School, but as a cooperative effort with the Community Action Program, the Marine Science Project conducted twenty field trips for disadvantaged children in the summer of 1968. These added a new dimension to the experience of the predominantly negro groups being served. These trips were loosely structured, variable in substance and intended more as field "experiences" than as "instruction".



SUMMER SCIENCE SCHOOL TAKES TO THE SEA



MARINE SCIENCE LIBRARY AND AUDIO-VISUAL AIDS

NEED: No film library existed in the county when the project began, but an A-V center was organized on a minimal budget in 1968. Attempts to get films on loan proved in 1967 that the procedure was unreliable.

BELOW: *Special class in nature appreciation for disadvantaged children.*

Reference libraries on marine science existed in the local laboratories and some books were in school libraries. However, there were many critical gaps and no central collection with which a curriculum development group could work.

APPROACH: Bibliographies of both books and movies were collected and sifted through during the planning grant. In 1968 twenty-three marine science films were added to the county A-V Center. About two hundred science volumes were installed in a reference and circulating library. The books were accompanied by a much larger collection of personal volumes of the Marine Science staff. They served as reference material for early curriculum planning and unit development. Unfortunately the entire collection burned in the fall of 1968 and has been only partially and slowly replaced by insurance reimbursement. The photographic record of the project was almost entirely destroyed, including many slides of marine habitats and animals.

The film library has been replaced and has grown to thrity-five fine marine science movies and forty film strips.

PUBLICATIONS

NEED: No basic publications explain natural environments of this area in lay language. No technical literature has a comprehensive view of the ecology of the middle Atlantic coast. No graded units are available to teachers who wish to use marine environments as study areas.

SOLUTION: Teaching units are the backbone of the project, forming an integrated series of field-trip oriented approaches to coastal environments. However, several basic publications will be of widespread interest and broad application.

Three of these are summaries of large subjects and provide reference material not available elsewhere.

"The Major Coastal Communities of North Carolina" was mimeographed in April of 1968 for use in in-service training and high school courses. A second mimeographed edition will be issued for the same reasons in 1969, although a commercially printed version is at the printer's and will be available by summer. The book is an introduction to the forces that shape coastal

PUBLICATION SCHEDULE

1 **MARINE SCIENCE FILM CATALOGUE** (second edition)
BY FRANK L. CHAPMAN

2 **THE MAJOR NATURAL COMMUNITIES OF THE CAROLINA COAST** (second edition)
BY JUDITH M. SCARFF AND WILL HON

3 **THE FIELD EXPERIENCE** (second edition)
BY LARRY W. YEATER

4 **THE REGIONAL MARINE SCIENCE PROJECT OF THE CARTERET COUNTY, N. C., PUBLIC SCHOOLS**
BY WILL HON

5 **SUMMER SCIENCE BY THE SEA** (an annual self-supporting fun-in-the-sun adventure)
BY BETH TAYLOR AND WILL HON

6 **A DAY WITH DON AT CAPE LOOKOUT SEASHORE** (third grade supplementary reader)
BY BITSY DUDLEY AND DORIS KING (illustrator)

7 **DON EXPLORES A TIDAL FLAT** (third grade supplementary reader)
BY BITSY DUDLEY AND DORIS KING (illustrator)

8 **HOW SEA ANIMALS LIVE** (fourth grade unit on individual adaptation)
BY FRANK L. CHAPMAN

9 **LIVING COMMUNITIES OF THE SEASHORE** (fifth grade unit on interrelationships)
BY FRANK L. CHAPMAN

10 **THE OCEAN AND MODERN MAN** (sixth grade on uses and abuses of the sea)
BY FRANK L. CHAPMAN

11 **SALT MARSH, SOUND AND SEA BEACH** (seventh grade unit on population dynamics
BY FRANK L. CHAPMAN

12 **THE SEA AND ITS BOUNDARIES** (eighth grade unit on coastal processes and oceanography)
BY FRANK L. CHAPMAN

13 **THE FIELD APPROACH TO COASTAL ECOLOGY** (spring and fall tenth grade biology units)
BY BETH TAYLOR

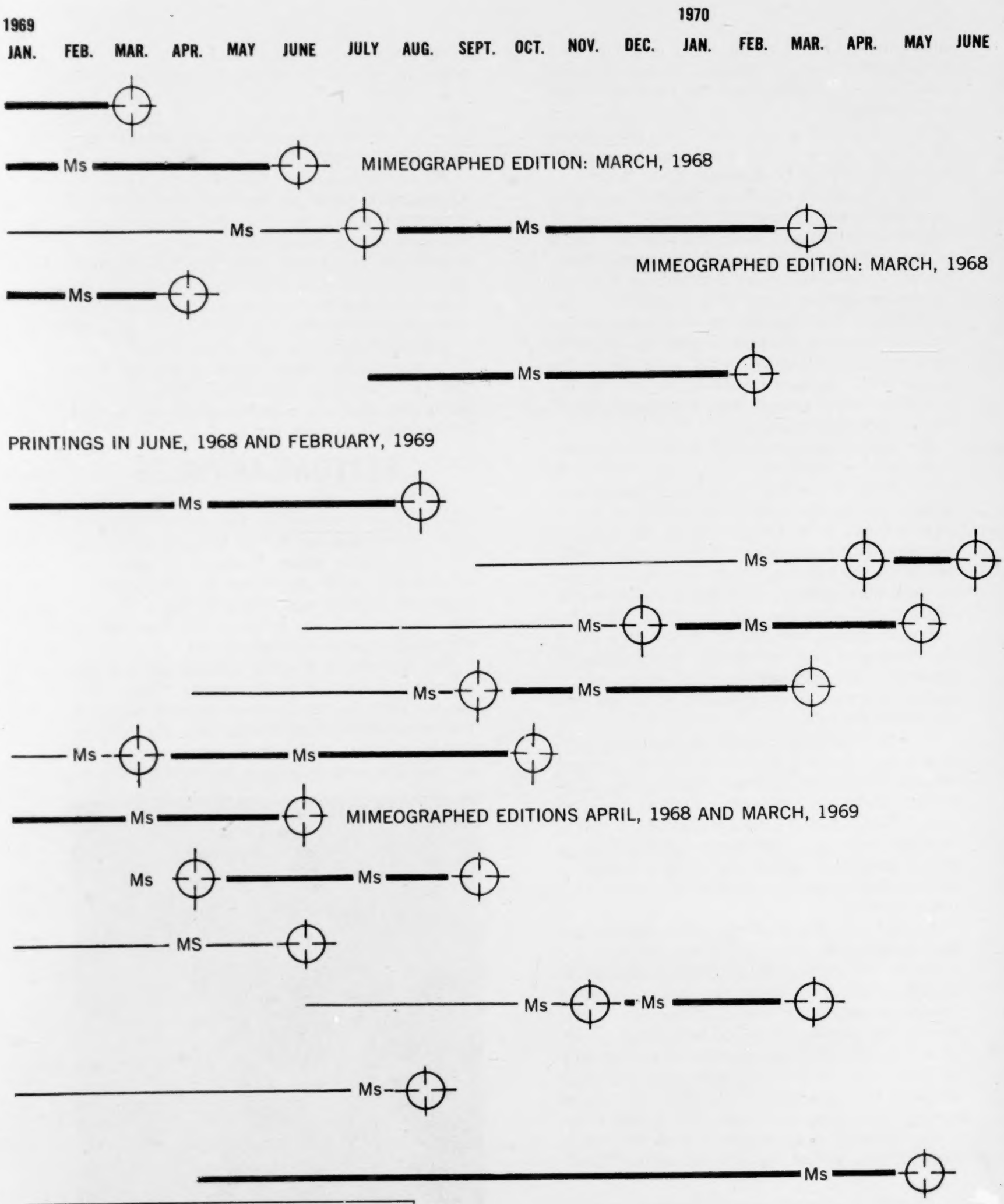
14 **EXPERIMENTS WITH SEA WATER** (supplements for high school chemistry courses)
BY EILMA REUSCH

15 **NORTH CAROLINA: OUR ROLE AT THE EDGE OF THE SEA** (text for a high school course in coastal resource management)
BY WILL HON

16 **MARINE ECOLOGY** (lecture, lab and field trip materials for a full year advanced biology course stressing research; college preparatory)
BY JUDITH M. SCARFF;

17 **MARINE SCIENCE** (a series of monthly feature articles compiled in booklet form)
BY JOANNE WHITNEY, WILL HON AND OTHERS

18 **ALL PUBLICATIONS EDITED AND ILLUSTRATED** (except where noted) BY WILL HON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environments and a survey of the major natural communities: ocean beaches, dunes, sounds, tidal flats, jetties and pilings and marshes. There is a community analysis, an overall picture, a cross-sectional diagram, a food web, drawings of the typical plants and animals, ecological notes and discussions of adaptations of organisms.

As a companion volume to the "Coastal Communities" book, a checklist of species found in tidewater Carolina is being prepared for simultaneous issue. It will include scientific name, common name, ecological distribution, seasonal abundance and the name of the authority for the information. The checklist is being compiled by leading research workers on the coast, with each author treating the phyla which he or she knows best. Keys to identification will be included for some groups, with a bibliography of source materials appended.

The third reference book will not be available until 1970. "COASTAL CAROLINA: Our Role at the Edge of the Sea" is being prepared as a partial text for the Coastal Affairs course in the high schools. It is a summary of the physical features of this region, of the marine resources and of all the agencies which are playing a role in their management. Included are sections on educational agencies which teach marine-oriented courses, and specific information about the programs and personnel of management agencies. This information is of wide interest and in dire need of compilation, so its use will far exceed the course.

Two publications concern methodology and materials. The FILM CATALOGUE (second edition) is now available. It lists movies, filmstrips, slides and records available for free loan. "THE FIELD EXPERIENCE: A WHY, A HOW" was a rationale for use of field trips in school programs. When the supply burned it was decided to issue a new field trip guide, now in preparation.

A great volume of mimeographed material has been prepared by Mrs. Scarff and others of the staff for the MARINE ECOLOGY course. It includes a detailed outline for a course; original lecture materials for over half the year (using *Life of the Seashore* by William Amos as a supplement); notes for adapting *The Oceanography* by Yasso for a major unit; additional materials adapted from the best authorities on coastal ecology; and weekly two-hour labs or field trips.

The material is a full year's work for a good class of high school juniors and seniors. However, it is likely that teachers will use this material only as a nucleus for developing their own course. It is available in mimeographed form to any interested teacher. Mrs. Scarff will also be glad to consult with any teacher considering the establishment of a similar course.

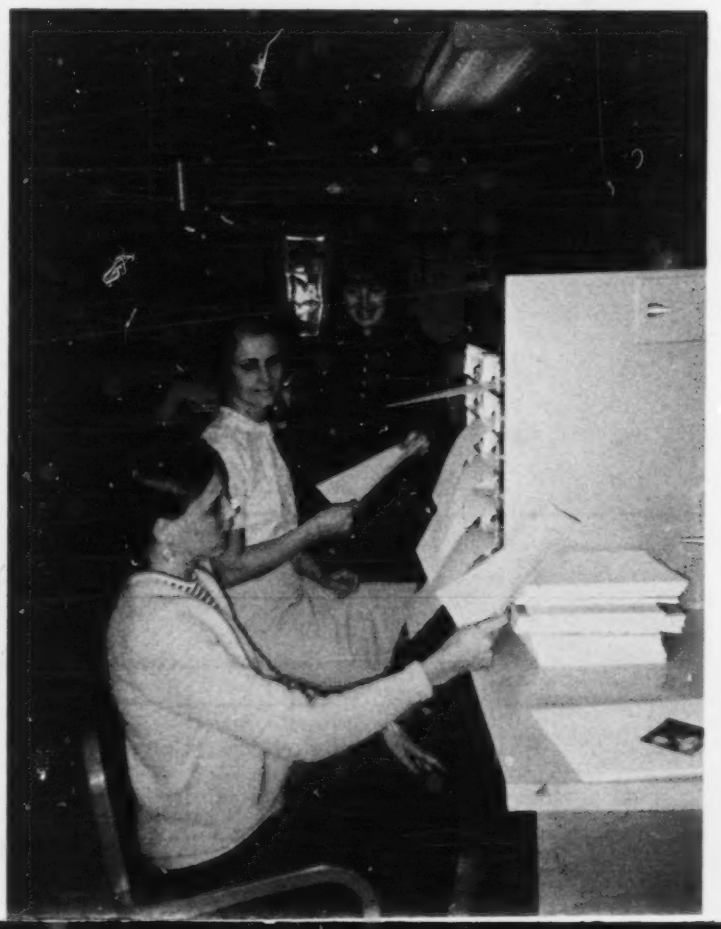
A projected schedule for release of all publications is included at the end of this section. Printing is one of the trickiest of all administrative procedures, requiring complex purchasing department paperwork and subject to printers' whims. The schedule of manuscript preparation is realistic, and teachers really needing information can get it from us in some form.

The teaching units are actually issued in a form which makes them usable as popular booklets on interesting coastal subjects. Teachers' notes are separate, mimeographed and subject to constant improvement.

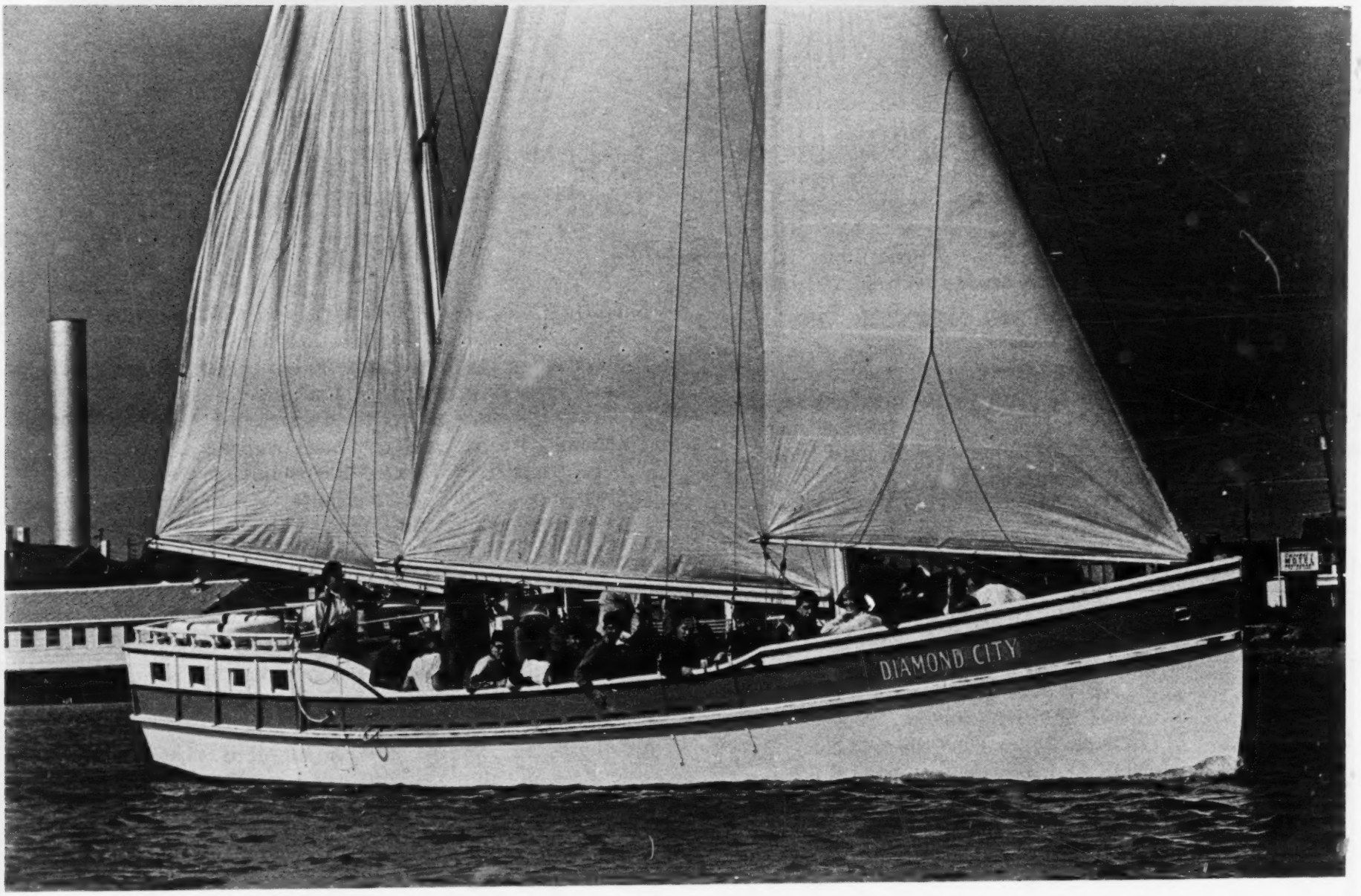
FEATURE ARTICLES

Numerous news articles, mostly feature stories, have appeared in the Carteret County *News-Times* and one in the Raleigh *News and Observer*. Extra copies, intended for later dissemination, were destroyed by fire. Several magazine articles are scheduled for 1969, but this booklet includes much of the information which will appear in these articles.

The exception is a series of thirty popularized articles on marine environments. These will appear first in the Carteret *News-Times* but will be available to all newspapers. The Marine Science Project will appreciate your help in getting other coastal papers to adopt the series.



Assembling mimeographed publications is among the most time-consuming jobs. For widespread distribution, books go to commercial printers in their final editions.



REGIONAL COORDINATION OF MARINE SCIENCE EDUCATION

NEED: All counties on the southern Atlantic coast face the same lack of teaching materials, described for Carteret County. There was, in addition, no local agency with the staff and time to review, evaluate and make available useful items.

APPROACH: From its inception the Marine Science Project has been designed as a regional center. Its significance in this respect will depend on the response of potential users of the material.

An encouraging indication for the future was a symposium on marine science education in May of 1968. In response to an invitation to administrators, eleven counties sent thirty key personnel to Atlantic Beach to discuss the program being offered by the Marine Science Project. An observer from the Advisory Council Committee on Marine Education, Dissemination and Facilities in Washington also attended to evaluate the possible role of such projects in a national effort to bolster oceanology.

Guidelines were laid down for participation of other counties in Marine Science Project activities:

1. PUBLICATIONS. All project results are available at all times to any system needing them. Samples of all formal publications will be distributed to all counties in the coastal plain of N.C. and to any other person or agency wanting to be added to the permanent mailing list. Reasonable quantities of publications will be distributed free of charge or counties may arrange to get larger quantities at cost.

   To insure wide application, Marine Science literature consciously steers away from references to local geographic features. Well-known North Carolina examples are used to illustrate points in the text. From a biological point of view, the literature is directly applicable to the area from Cape Hatteras to Wilmington or beyond. With little adjustment to local situations, the books would be quite usable southward to Savannah and northward at least to Chesapeake Bay.

2. IN-SERVICE TRAINING. All future in-service sessions will be broadly publicized and will be open to out-of-county teachers. At present all expenses will be covered by the Marine Science Project, but future programs may require local participation.
3. CONSULTATION SERVICE. The Marine Science staff often confers with educators from primary to graduate school level and is glad to be involved in any planning sessions which involve marine science, general ecology or field trips as facets of education.
4. FIELD TRIP GUIDANCE. Teachers using our units are welcome, within the limits of our resources, to bring groups to us for field trips. Special trips also may be arranged. In-service programs of the Marine Science Project will be a great asset to teachers who plan to use the units. The project will also set up a workshop on use of field trips for any county wanting to make a concerted effort to encourage teachers to make more and better use of field trips.
5. LIBRARY MATERIALS. Both books and audio-visual aids are available to anyone who needs them. Some books critical to curriculum development are kept in the library, but serious researchers who wish to spend time with the staff and reference sources are welcome. A filing system of current articles is also available.

   Movies and film strips are also available for free loan, as listed in the film catalogue. The only restriction is that movies used as part of our teaching units are reserved during the month or more that our teachers use them.
6. REGIONAL NEWS. Our function of keeping administrators and teachers informed and inspired obviously faltered after the fire that destroyed the first center. The Marine Science Project, however, is again in the position to issue period news and feature items, to sponsor occasional conferences and to serve as an exchange for ideas. Your inquiries or suggestions will be appreciated.

For May of 1969 an informal attempt to coordinate the efforts of several marine science education is planned. Guests will see a variety of student activities to serve as a foil for discussing techniques of education.

PLANNING FOR AN EXHIBIT LABORATORY AND FIELD TRIP CENTER

NEED: No Carteret County school has facilities to encompass the Marine Science Project as designed in the planning period. As a curriculum development program it has thrived in temporary quarters and utilized space in individual schools. As an instructional program it has been limited by lack of a specialized facility. Even more severe are the limitations on services to other school systems.

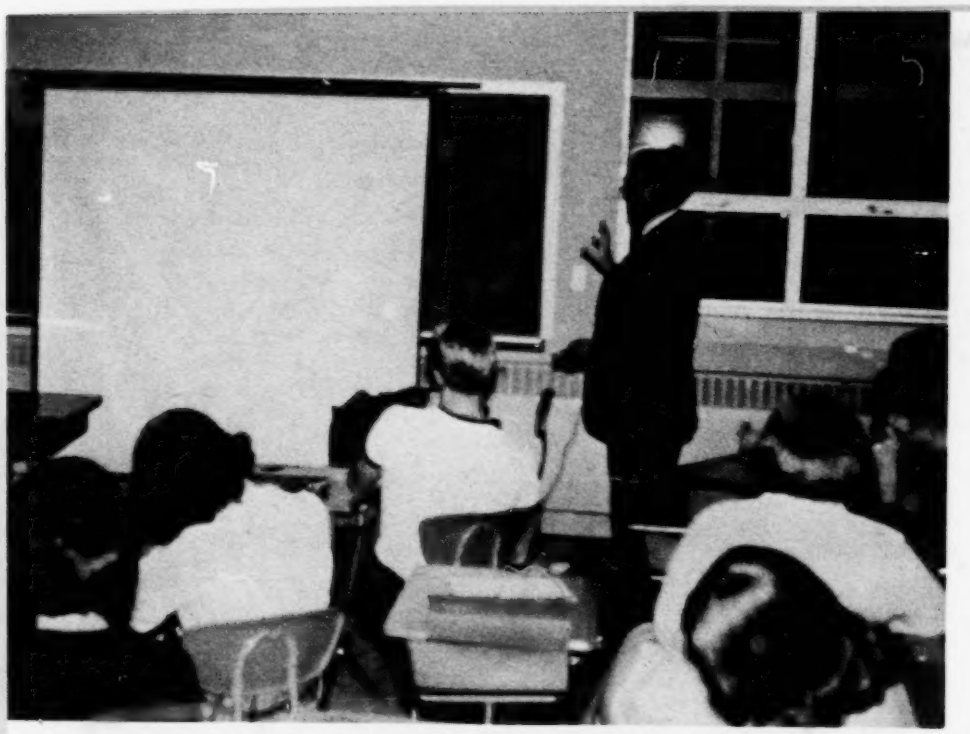
Field trips have been successfully conducted from local classrooms by relying on local marine laboratories for "wet lab" facilities.

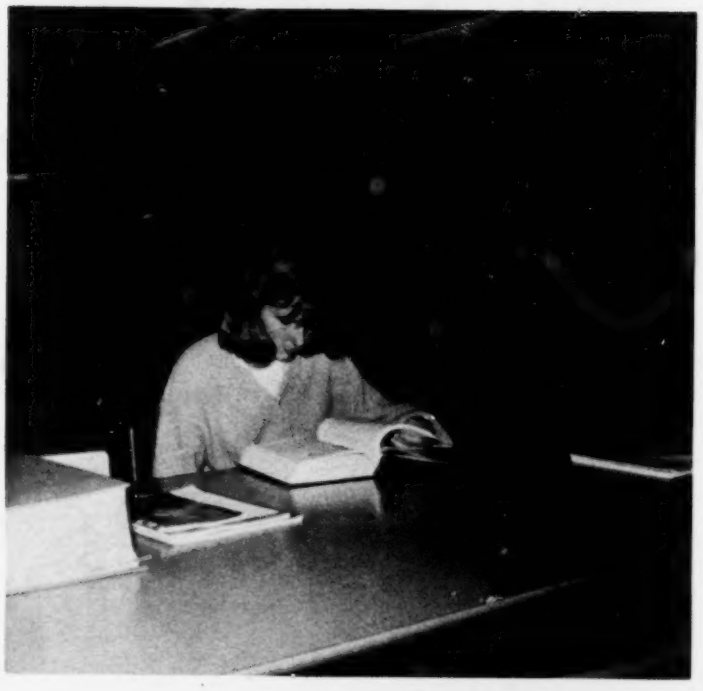
However, as the project expands to work with other counties, neither the schools nor the marine labs can absorb the mushrooming demands for space.

APPROACH: More than a hundred possible sources of funding have been contacted, and brief presentations have been made to officials of half a dozen agencies which have specific interest in the future of marine science education in this region. Some responses have been encouraging enough to indicate further effort.

Each agency approached has slightly different objectives from the others, so several concepts for the facility have been envisioned. With the hope of evolving a less expensive, more flexible and more expandable building, the director has worked with an architectural firm to offer alternatives to his own design. The original concept, created by Will Hon during the planning grant, was a $350,000 building with over 15,000 square feet of exhibits, demonstrations, aquaria, small auditorium, reference room, office space, workshops and six saltwater laboratories. New approaches trent toward open air exhibits, module construction, multiple-use areas and movable partitions. The ideas will be published if never used in execution of the building.

Whenever schedules permit, out-of-county classes are served by the project. Here an upstate class arrives for two hours of unique field experience.





COOPERATION OF THE LOCAL LABS

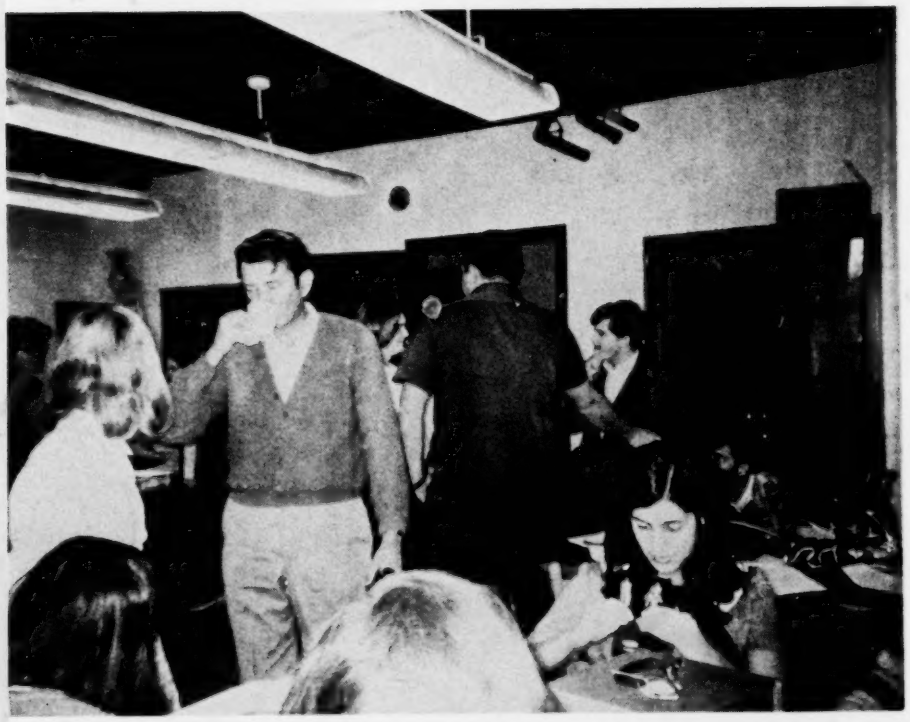
One of the highlights of the project has been the enthusiastic participation of local marine biologists. Time, advice, technical assistance, lectures, research facilities and even office space have been provided for project activities.

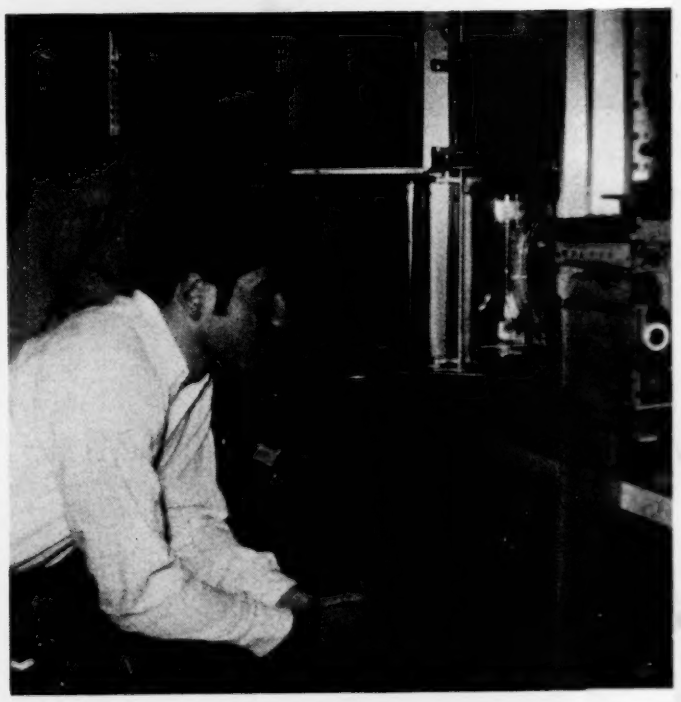
Left above, a lab director lectures to a high school class, and below a student uses his technical library. Below are two scenes of a guided tour and lecture in which students observe professional research underway. All of these personnel are from the Radiobiological Laboratory of the Bureau of Commercial Fisheries. Their library is jointly operated with the Biological Laboratory, which also cooperates with the Marine Science Project in many activities.

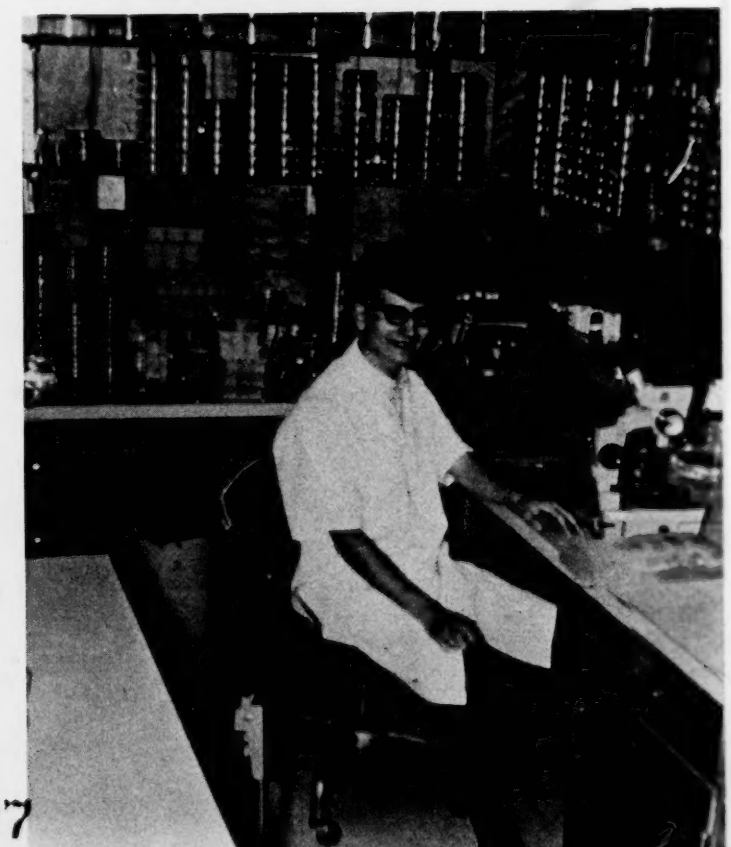
Right above are two pictures of students aboard the "Advance II," a training vessel of the Cape Fear Technical Institute.

Below, to the left of the page, are two scenes at the UNC Institute of Marine Sciences, one in which a staff member helps as the project uses their salt-water lab for a plankton study and one in which a researcher guides a student in a complex individual problem.

To the right are two laboratories of the Duke University Marine Laboratory, examples of the many cases in which facilities and personnel gave tremendous individual help.







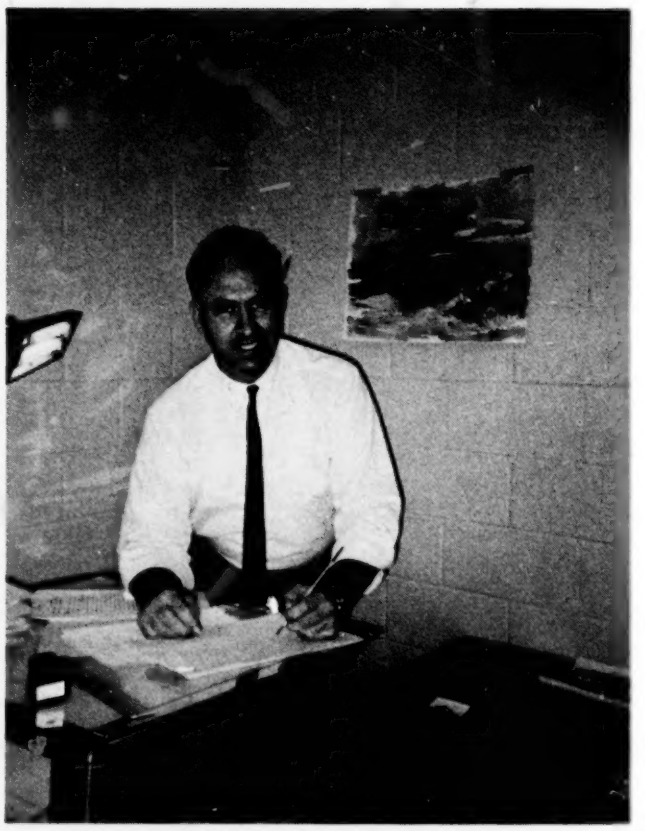
CONCLUSION

It may well be, as Rachel Carson mused, that it is not as important to *know* as to *feel*. The Carteret Marine Science Project may create few research biologists, but it can scarcely fail to make our clerks, salesmen and firemen of the future acutely aware of the complex marriage of land and sea. The intertwining of these two worlds is fraught with the greatest potentials and the most grievious of problems.

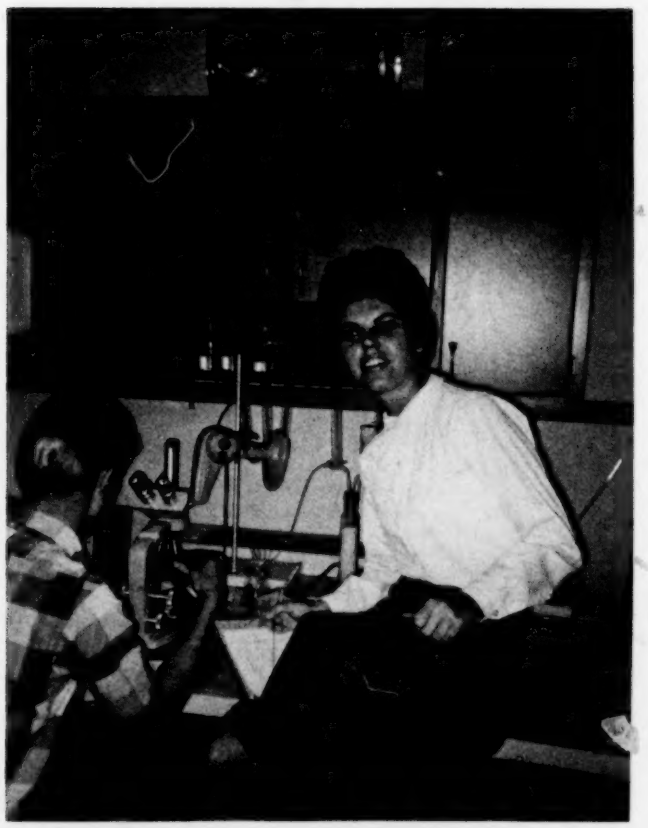
The objectives and approach of the Marine Science Project may be summarized in this ideal state of mind:

We will be happy if our students, in the years ahead, can never pass a marsh, a mudflat or a beach without having their curiosity piqued enough to try once again to answer the questions raised by our study of these habitats. Every future encounter then becomes a chance to add a few more facts to an equation and to get a better answer.

DIRECTOR



WILL HON has supervised both the planning and operational phases of the project since September of 1966. Mr. Hon is an enthusiastic ecologist, with a B.S. in Wildlife Management and an M.S. in Animal Ecology (ornithology) from N.C. State University, where he was engaged in a doctoral program when hired to head the project. He served two years as an army lieutenant, one in Korea in 1950. Hon was chief of information and education for the Tennessee Game and Fish Commission for five years, was science teacher in a private school two years, and returned to N.C. State as a zoology instructor. In 1964, he became an editor and pesticide education specialist for the Agricultural Extension Service, on the campus, while continuing the Ph. D. work. Will is staff artist, illustrating project literature and preparing exhibits. He is active in restoration of historic Beaufort, N.C., is a renovator of old houses, a Sunday school teacher and a weekend painter. His hometown is Charlotte, N.C. His wife is a teacher and they have a son nine years old.



CURRICULUM SPECIALIST

JUDITH SCARFF is a native of Beaufort. She joined the project in June of 1967 when she received her M. E. degree in Science Education from Duke University. Her B.A. (science major) was from Salem College. Miss Scarff's preparation includes summer courses and work as a research assistant at Duke University in Durham and the Duke Marine Lab, and summers in the family's cottage on isolated and beautiful Shackleford Banks. Judie is an accomplished pianist and helps with local musical dramas.

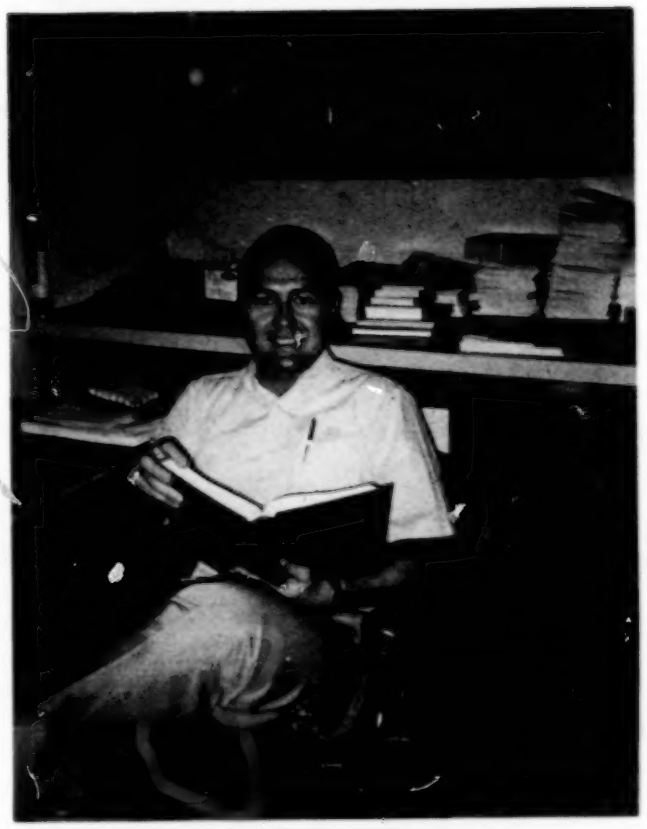
In addition to teaching the ARINE ECOLOGY course, she has authored some basic publications and news articles, has worked with high school students in a great variety of extra-curricular activities and is responsible for evaluation procedures of the project.

CURRICULUM SPECIALIST

FRANK CHAPMAN came to the project in August of 1967 from Florida State University, where he had just completed his Master of Science degree in biology. Besides considerable background in marine science, his experience includes: one year of teaching junior high earth science, assistant in Vertebrate Zoology course at F.S.U., two springs of ornithological research over the Peninsula of Florida, and six weeks in the Republic of Panama studying birds and bats. He is a SCUBA diver, a swimming and first aid instructor and has recently received his license for piloting light aircraft.

He lives by the water at Smyrna, where he has a boat and a retriever. His spare time is spent fishing, birdwatching and flying. His wife Jerre is a radiological technologist at Sea Level Hospital.

His work with the project is primarily the development of curriculum units for grades four through eight, but encompasses teacher workshop planning and dissemination of project materials.



FIELD SPECIALIST

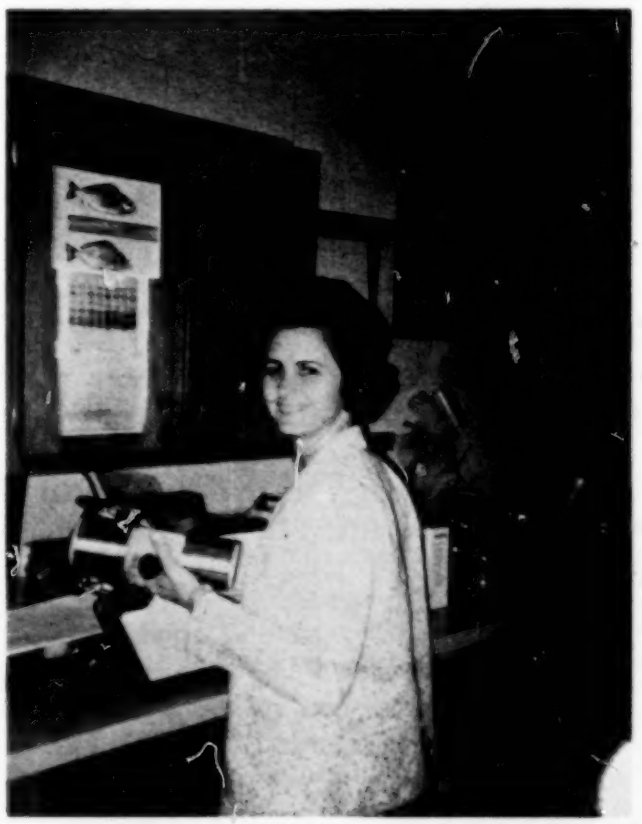
LARRY YEATER joined the staff in July of 1967, leaving a doctoral program at Florida State University. His Ph.D. work was in Science Education but his M.S. was in Zoology(marine biology). His experience includes an expedition to Antarctica with Operation Deep-Freeze. Field trips have always been a special interest. His chief function with the project is to design and conduct field activities. He handles most of the project's photographic work. Mr. Yeater is a swimming instructor, muzzle-loading fan, avid hunter and fisherman. He has been active in local conservation efforts, is president of the Carteret County Wildlife Club and teaches hunting safety and marksmanship to young people. He is from West Virginia, unmarried, and lives now in Beaufort.

CURRICULUM SPECIALIST

BETH (MRS. PERRY) TAYLOR is a part time curriculum specialist, working so far on the tenth grade units and assisting in the two marine science courses. Mrs. Taylor holds a B.S. (biology) from Pfeiffer College and an M.A.T. (zoology major) from Duke University. She studied two summers under NSF grants, has taken summer coursework at Duke Marine Lab, and served as research assistant at UNC Institute of Marine Science and Bowman Gray School of Medicine. She has taught high school general science and biology and adult night school. She has a son one year old.

FIELD ASSISTANT

DICK LEWIS joined the staff in the fall of 1968 when the project acquired its own bus. He is from Harker's Island which is a stronghold of fishing families who cling to the good life discovered there generations ago.



SUPERINTENDENT

T. LENWOOD LEE has not only given support to the project, but was in fact its creator. In talks with Dr. Deubler and other marine biologists, he turned the apparent but elusive gap between scientists and public into an ESEA Title III project proposal.

SECRETARY-BOOKKEEPER

PATSY FEAGLE has been with the project from early planning stages. She is the granddaughter of whalers who lived on now-deserted Shackleford Banks, and retains the down-east love of the sea.

CHAIRMAN OF THE BOARD OF EDUCATION

DR. AL CHESTNUT, director of the University of N.C. Institute of Marine Sciences, occupied key positions linking biologists to educators and gave himself and his staff when needed to initiate the project.

THE ADVISORY COMMITTEE

DR. EARL DEUBLER was, at the time of the project's creation, an ichthyological researcher at the University of N.C. Institute of Marine Sciences. A father himself, he was keenly aware of education problems and is now a teacher at Hartwick College in New York State.

DR. AUSTIN WILLIAMS, a specialist in crustaceans at the U.N.C. Institute of Marine Sciences, served as chairman of the committee during the first critical year; father of a high school boy.

DR. SANDY WOODS, mother of elementary school children, with scientific training and experience as Science School director and lab assistant at Duke Marine Lab.

DR. THOMAS DUKE, now director of the Gulf Breeze Laboratory in Florida, assisted in the early stages of the project when he was with the U.S. Bureau of Commercial Fisheries Radiobiological Laboratory in Beaufort.

ANN (MRS. JOHN) COSTLOW, is wife of the director of the Duke Marine Laboratory, but brought her own knowledge to the committee as a mother and Summer Science School instructor.

DR. WINONA VERNBERG, half of a noted husband-wife research team at Duke Marine Lab, is also a mother and resident of a small coastal community.

AN E.S.E.A. TITLE III PUBLICATION

by the

REGIONAL MARINE SCIENCE PROJECT

of the

CARTERET COUNTY PUBLIC SCHOOLS

Beaufort, N. C.

T. LENWOOD LEE, *Superintendent*

THE LIVELIEST CLASSROOM IS LIFE ITSELF